High Pressure Access Systems

Operation Manual

Metal Samples Corrosion Monitoring Systems
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High Pressure Access Systems

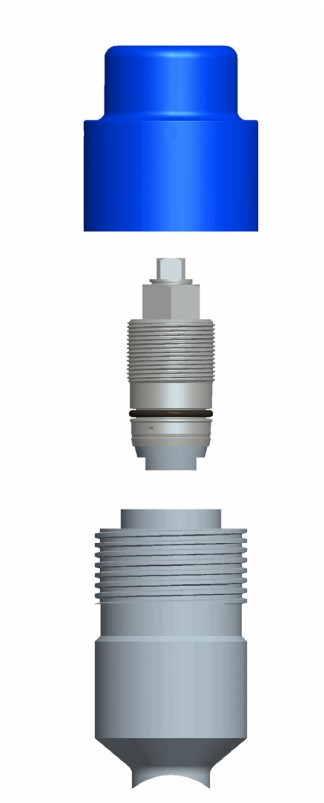
System Overview

High Pressure Access Systems are specialized piping arrangements which permit internal access to production plant vessels and pipework operating under full process conditions. The corrosion monitoring industry standard for such access systems is based on a 2-inch nominal bore design.

When operated with a **Retrieval Tool and Service Valve**, high pressure access systems allow the installation and retrieval of corrosion monitoring coupon holders, probes, chemical injection equipment, and other devices to be carried out safely and without plant shutdown, at working pressures up to 3,600 psi.

High pressure access systems are used most frequently (although not exclusively) in oil and gas production operations. This is typical of high pressure operations in which users are not prepared to shut down and depressurize process systems in order to remove or install corrosion monitoring devices.

The Access Fitting Assembly consists of three main components:



1. **Protective Cover** – designed to protect the external threads of the access fitting body.

2. **Plug** – the carrier for the installed device. Depending on the type of device being used, a solid plug or a hollow plug is selected. The plug assembly screws into the access fitting body and seal the bore of the fitting to contain line pressure.

3. **Access Fitting Body** – the specialized pipe fitting which is permanently attached to the process plant vessel or pipework.

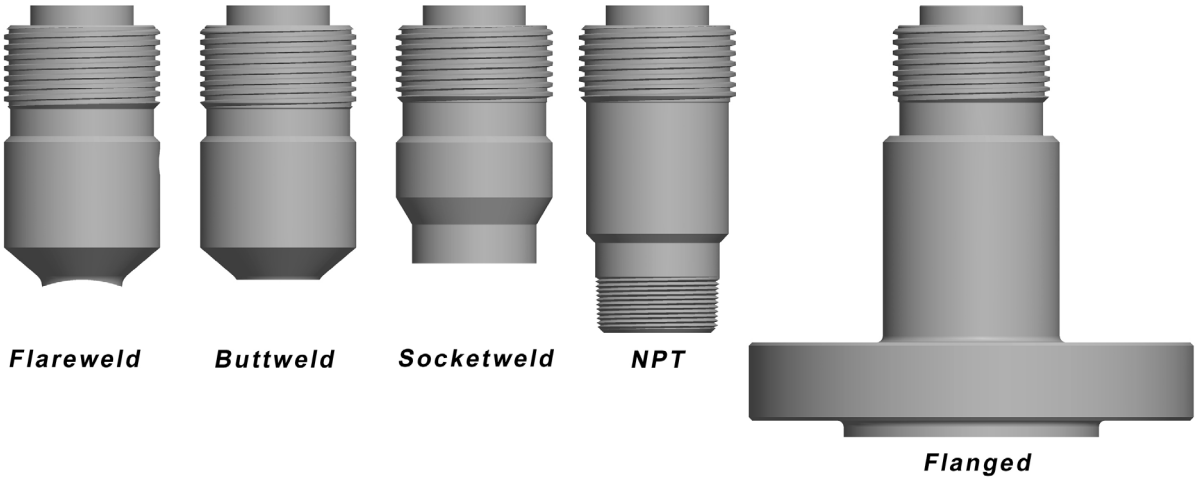
Safety Precautions

1. Good engineering and operational practices should be adhered to at all times.
2. Do not use the retrieval tool unless you have familiarized yourself with its operation.
3. If this is the first time you have used the equipment or you are an infrequent user, you should review the manual and, if possible, perform a trial operation on a mock fitting.
4. In addition to the requirements of this manual, all plant safety requirements and environmental regulations must be followed.

Access Fitting Body

Access Fitting Body Types

High Pressure Access Fitting Bodies are available in styles that may be welded (Flareweld, Socketweld, and Buttweld), threaded (NPT), or flanged (API, ANSI RF, ANSI RJ) to the pipe or vessel wall.



1. **Flareweld** – HP1000/HP1100 Flareweld bodies are the most widely used. These bodies incorporate a reinforced welding neck and also have a radius machined into the base to accommodate the curvature of the pipe or vessel to which the body is welded.

2. **Buttweld** – HP2000/HP2100 Buttweld access fittings are designed to be buttwelded directly to a 2” pipe end.

3. **Socketweld** – HP3000/HP3100 Socketweld fittings are designed to be welded directly to a 2” socket end.

4. **NPT** – HP4000/HP4100 NPT fittings can be threaded into a 2” female NPT fitting.

5. **Flanged** – Flanged fittings are available in three standard configurations:
   a.ANSI Ring Joint (RJ) – HP5000/HP5100
   b.ANSI Raised Face (RF) – HP6000/HP6100
   c.API – HP7000/HP7100

Access fittings are manufactured from materials which conform to NACE MR-0175 specifications for sour service. Choice of material for the access fitting body is based on minimum operating temperature as well as process stream corrosivity. "Standard" temperature materials are suitable for use above a minimum operating temperature of -20°F (-29°C). "Low Temperature" materials should be selected for minimum operating temperatures below this value.

The Metal Samples Corrosion Monitoring Systems standard material specification for Flareweld Socketweld, Buttweld, and NPT bodies is AISI 1018 for standard temperature and ASTM A350LF2 for low temperature. For flanged fittings, ASTM A105 is used for standard temperature and ASTM A350LF2 for low temperature. However, all access fitting components can be made to order in any customer-specified material; carbon or stainless steel, duplex materials, or other more exotic alloys.

All access fitting bodies have an external 3-inch ACME thread, which is used to attach the service valve during retrieval operations. Access fitting bodies should always be fitted with a cover which is designed to protect both external thread and also the service valve sealing surfaces.

Tee Type & Non-Tee Types

Access Fitting Bodies are available as either **non-tee types** or **tee types**.

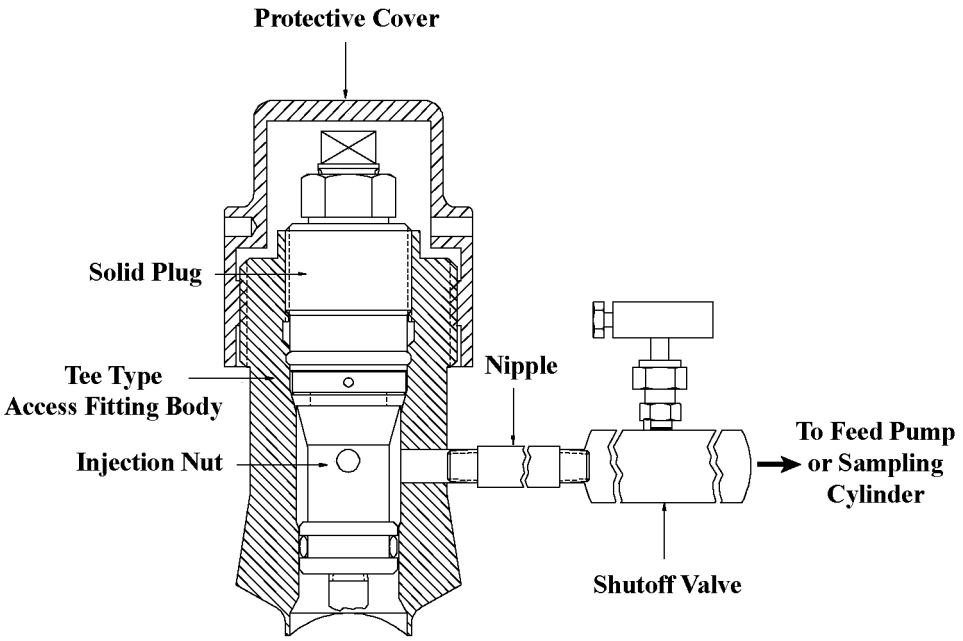
Non-tee access fitting bodies are used in applications such as coupon holders and monitoring probes.

Tee type access fitting bodies are used in applications where inlet or outlet access to the process stream is required.

A side-tee port is drilled and tapped in the access fitting's extra thick body to provide an integral connection point for a nipple and shut-off valve arrangement. Fittings with 1/4", 1/2", 3/4", or 1" FNPT side-tee ports are available as standard items.

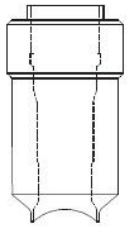
Tee type access fitting bodies are used with Chemical Injection Systems, Sampling, and Sand Monitoring Systems. If required, the side-tee port may be sealed off with a pipe plug. This would allow devices normally used with the non-tee type access fittings to be used with the tee type access fittings.
NOTE: The installation and removal of the pipe plug requires the process stream to be shut down and depressurized.

The materials of construction of tee type access fitting bodies are the same as the non-tee type access fitting bodies.

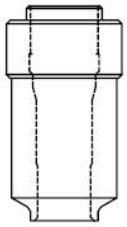


Injection System using a Tee Type Access Fitting Body

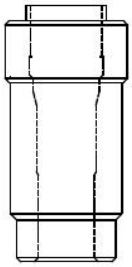
Non-Tee Types



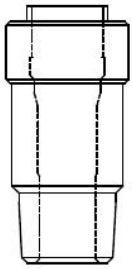
Model HP1000
Flareweld



Model HP2000
Buttweld

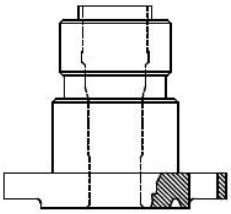


Model HP3000
Socketweld

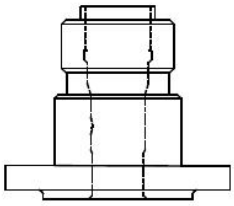


Model HP4000
NPT

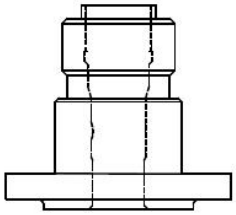
Model	Height (in)	Weight (lbs)
HP1 000 Fla reweld	5.25	5.5
HP2000 Buttwe ld	5.25	4.5
HP3000 Socketweld	6.25	4.5
HP4000 NPT	6.25	4.5



Model HP5000
ANSI Flange RJ



Model HP6000
ANSI Flange RF

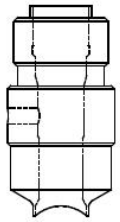


Model HP7000
API Flange

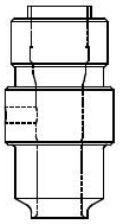
Flange Size	Height (in)	Weight (lbs)
150#	5.25	10.50
300#	5.25	11.50
4/600#	6.25	15.25
9/1500#	6.25	30.75
2500#	6.25	40.00

Temperature Rating: -20° F (28.9° C) to +350° F (176.6° C)
Pressure Rating: 6000 PSI or as Flange Size

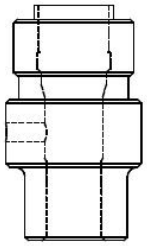
Tee Types



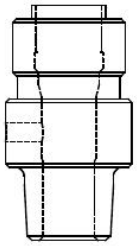
Model HP1100
Flareweld



Model HP2100
Buttweld

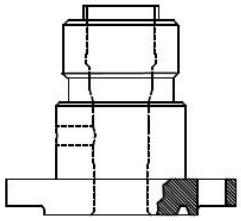


Model HP3100
Socketweld

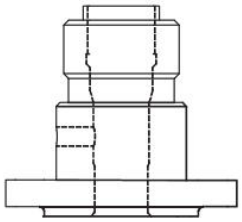


Model HP4100
NPT

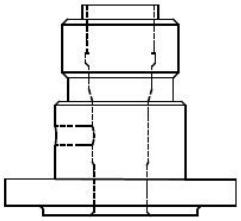
1/4" T		1/2" T		3/4" T		1" T	
Weight (in)	Weight (lbs)	Height (in)	Weight (lbs)	Height (in)	Weight (lbs)	Height (in)	Weight (lbs)
5.25	4.5	6.25	5.75	6.25	6.5	7.25	7



Model HP5100
ANSI Flange RJ



Model HP6100
ANSI Flange RF



Model HP7100
API Flange

Model	Flange Size	1 /4 " T		1 /2 " T		3/4 " T		1 " T	
		Height (in)	Weight (lbs)	Height (in)	Weight (lbs)	Height (in)	Weight (lbs)	Height (in)	Weight (lbs)
HP5100 ANSI Flange RJ	150#	5.25	9.50	7.25	10.00	7.25	10.00	7.25	10.50
	300#	5.25	11.50	7.25	11.75	7.25	12.00	7.25	12.00
	4/600#	6.25	12.75	7.25	13.00	7.25	13.00	7.25	13 .00
	9/1500#	6.25	25.75	8.25	26.00	8.25	26.25	8.25	26.50
	2500#	6.25	40.20	8.25	40.50	8.25	40.40	8.25	40.75
HP6100 ANSI Flange RF	150#	5.25	9.75	7.25	10.00	7.25	13.00	7.25	13.00
	300#	5.25	11.50	7.25	11.75	7.25	17.00	7.25	17.00
	4/600#	6.25	12.75	7.25	13.00	7.25	18.00	7.25	18.00
	9/1500#	6.25	25.75	8.25	26.00	8.25	38.00	8.25	38.00
	2500#	6.25	40.10	8.25	40.50	8.25	45.50	8.25	45.50
HP7100 API Flange	2000#	6.25	15.75	7.25	18.00	7.25	18.00	7.25	18.00
	3/5000#	6.25	31.00	8.25	38.00	8.25	38.00	8.25	38.00
	10000#	6.25	40.50	8.25	45 .50	8.25	45.50	8.25	45.50

Temperature Rating: -20° F (28.9° C) to +350° F (176.6° C)
Pressure Rating: 6000 PSI or as Flange Size

Attaching the Access Fitting Body

Access Fitting Bodies which have a welded end connection (flareweld, buttweld, or socketweld), must be welded according to local and plant codes.

NPT type access fittings are manufactured in accordance with ANSI/ASME B1.20.1 -Specification for Taper Pipe Threads. This fitting should be installed by a qualified technician using standard protocol for taper pipe threads.

ANSI flange fittings are manufactured in accordance with ANSI B16.5 – Specification for Flanges and Flanged Fittings. Flange gaskets and stud-and-nut sets are not provided with the access fitting body. This fitting should be installed by a qualified technician using standard protocol for flange installation.

General Welding Instructions

1. Determine if the system in which the access fitting is to be placed will permit welding.
2. Remove the plug assembly from access fitting prior to welding.
3. Protect the internal and external threads from weld splatter with a temperature resistant cloth wrapped around the body and dampened on the outside only.
4. Place the access fitting on the line and align.
5. Establish proper weld gap by placing 1/16" spacer rods under the access fitting.
6. Most steels should be preheated prior to welding when the fluid or metal temperature is less than 50°F.
7. Arc welding should be used to minimize warping.
8. Preheat access fitting body to 400°F and tack weld, using AWS 1/8" welding rod of the proper grade.
9. Remove weld gap spacers. Remove tack weld slag.
10. Tie the root pass into the tack weld to make complete fusion. Apply a stringer bead around the base of the fitting, removing slag at each pass.
11. Tempil sticks should be used to insure that the access fitting body temperature does not exceed 1000°F.

12. Apply continuous cover beads to fill the bevel.

13. Apply a post heat of 600°F for fifteen (15) minutes. Wrap with insulating cloth and allow to cool.

14. Hot tapping will be necessary for lines in service.

***Note**: Weld time approximately one (1) hour with welder and helper.*

The procedure described above is for general access fitting installation reference. Metal Samples Corrosion Monitoring Systems **shall not** be held responsible or liable in any way for loss or damage resulting therefrom, or any regulations which they may conflict.

Plug Assemblies

The Plug Assembly is the retrievable carrier which holds corrosion monitoring, chemical injection, or various other devices which may be installed through the access fitting. There are two distinct types of plug assemblies - the Solid Plug and the Hollow Plug.

The plug assembly screws into the bore of the access fitting body and is designed to seal the fitting against line pressure. When tee type access fittings are being used, a pipe plug or nipple and shut-off valve is additionally required to seal the fitting.

The standard material of construction for the plug assembly is 316 Stainless Steel. It should be noted that when stainless steel or duplex materials are specified for the access fitting body, the plug assembly should be specified to be Nitronic 60 to prevent thread galling.

All plug assemblies are individually pressure tested at the factory and are rated for operation at 3600 psi. The operating temperature range for standard plug assemblies is -50°F (-45°C) to 350°F (176°C), but this range can be extended by use of alternative sealing materials.

Solid Plugs

Solid plugs carry coupon holders, injection/sampling systems, sand probes, and bioprobes

The solid plug nut is unscrewed from the base of the plug and replaced by the device being installed. A left-hand thread is used to ensure that installed devices do not become loose during the retrieval procedure.

Pipe Plug – Protects internal threads and provides secondary backup seal. Must be removed during retrieval operations.

Solid Plug Body

O-Ring Seal

Primary Packing Seal

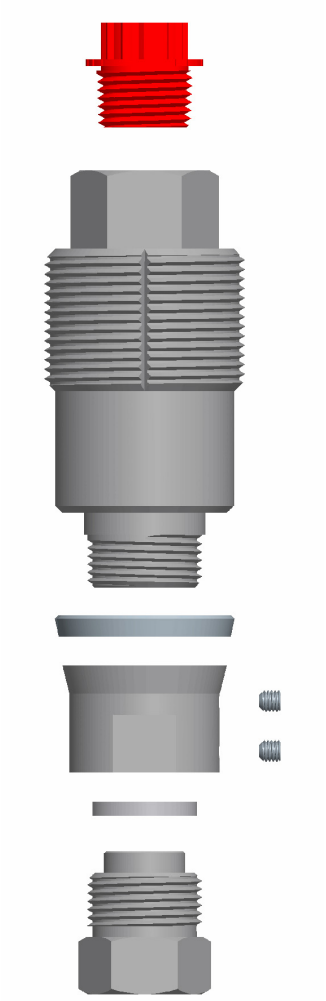
Solid Plug Nut – Only used when no other device is attached.

Description	Part No.	Material
Pipe Plug	HA700697158	316SS
Solid Plug Body	HA700006158	316 SS
O-Ring	HA700600834	Viton®
Primary Packing	HA700266785	PTFE (25% G)
Solid Plug Nut	HA7002101 58	316 SS
SetScrew	09158E1032ST0187	316SS

Hollow Plugs

Hollow plugs are used with electrical resistance probes, linear polarization resistance probes, and hydrogen probes.

To connect these devices, the hollow plug seal nut is removed and the monitoring device is screwed into the female thread in the base of the hollow plug. A left-hand thread is used. Access is allowed through the top of the hollow plug for electrical connections to be made directly to probes for the purpose of taking readings.



Thread Protector – Must be removed during retrieval operations.

Hollow Plug Body.

Primary Packing Seal.

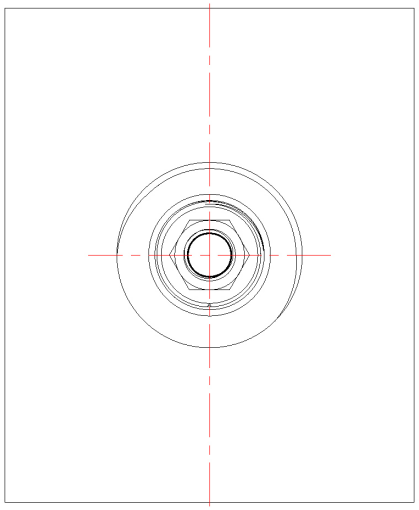
Hollow Plug Nut.

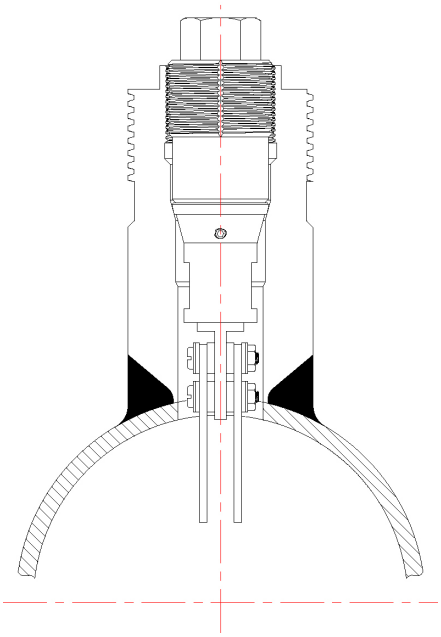
Device Seal.

Bore Seal Nut – Only used when no other device is attached.

Description	Part No.	Material
Pipe Plug	HA700167	Plastic
Hollow Plug Body Anti-Gall Coating	HA700300158	316 SS
Primary Packing	HA700266785	PTFE (25% G)
Hollow Plug Nut	HA700302158	316 SS
Set Screws (2)	09158E1032ST0187	316 SS
Probe Packing	HA700277785	PTFE (25% G)
Hollow Plug Bore Sealing Nut	HA700311158	316 SS

Installing & Orienting the Plug





If the corrosion monitoring device requires radial orientation with the product flow (coupon holder, LP probe, injection quill, etc.), you will need to “reference” or “index” the plug assembly by filing a notch across the top of the hex (see left). The notch should be filed so that the device can be aligned with the product flow. Apply an appropriate grease to the full length of the plug.

If inserting the plug under pressure, use the Retriever Tool and Service Valve.

If inserting the plug manually, thread the plug assembly into the access fitting body. Do not use excessive force and be sure that the threads engage properly to prevent cross-threading.

The reference mark as previously mentioned must now be aligned to product flow direction. Turn the plug assembly hex clockwise until the mark aligns to the flow direction.

Make sure the fitting is clean and dry, and install the thread protecting pipe plug into the top of the plug.

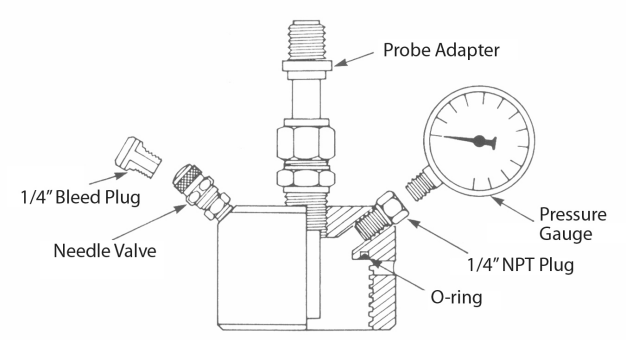
Protective Covers

Protective covers are designed with internal threads which mate with the access fitting body and are recommended to prevent damage to the fitting's exterior thread. In addition, they protect the surfaces against which the service valve seals during retrieval operations.

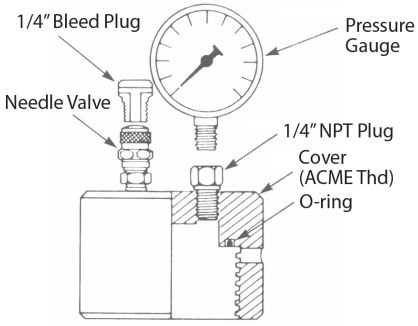
Heavy Duty Pressure Rated Covers

Heavy duty pressure rated covers are manufactured as standard in AISI 1018 and are supplied with a paint coat finish suitable for the most aggressive environments. Covers are individually pressure tested for a pressure rating of 4000 psi and are available with an optional bleed valve and/or pressure gauge.

Covers are available with or without a center hole. Center holes are required when an external sensor connection is required to be permanently installed. Covers with an unthreaded 1 3/8" (3.5 cm) diameter center hole are required for installations where mechanical Hydrogen Probes are installed. Covers with a 1/2" NPT center hole are required where continuous monitoring of electrical probes is required. Connection of an electrical probe to a permanent monitoring instrument requires the use of a probe adapter that extends through the 1/2" hole in the cover. The probe adaptor must be ordered separately.



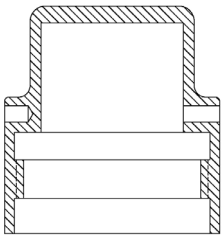
Heavy duty pressure rated cover with ½" NPT center hole and with 2 ea. ¼" NPT holes for needle valve and pressure gauge



Heavy duty pressure rated cover without center hole and with 2 ea. ¼" NPT holes for needle valve and pressure gauge

Non-Pressure Rated Covers

More economical than heavy duty pressure rated covers, non-pressure rated covers are internally threaded to protect against mechanical damage to the external access fitting threads. Non-pressure rated covers are available in plastic or metal, with the plastic version having the added advantage of being lightweight and non-sparking. They can be ordered with or without a center hole.



Protective Covers – Part Numbers

Description	Application	Part No.	Material	Weight
Non-Pressure Rated Cover without Hole	Intermittent Monitoring - Chemical Injection	HA700734413	Carbon Steel	2.5 lbs. (1.6 kg)
Non-Pressure Rated Cover w/ 1/2" NPT Hole	Continuous Monitoring	HA700732413	Carbon Steel	2.0 lbs. (0.9 kg)
Non-Pressure Rated Cover without Hole	Intermittent Monitoring	HA700436709	Nylon	0.5 lbs. (0.2 kg)
Non-Pressure Rated Cover w/ 1/2" NPT Hole	Continuous Monitoring	HA700435709	Nylon	0.5 lbs. (0.2 kg)
Heavy Duty Pressure Rated Cover w/o Hole	Intermittent Monitoring (rated for 6,000 PSI)	HA700735413	Carbon Steel	9 lbs. (4.1 kg)
Heavy Duty Pressure Rated Cover with 1/2" NPT Hole	Continuous Monitoring - provides a secondary seal and allows for probe adapter (rated for 6,000 PSI)	HA700731413	Carbon Steel	9 lbs. (4.1 kg)
Heavy Duty Pressure Rated Cover and Bleed Valve	Continuous Monitoring - provides a secondary seal (rated for 6,000 PSI)	HA700480413	CS (cover), 316 SS (bleed val.)	9 lbs. (4.1 kg)
Heavy Duty Pressure Rated Cover, Bleed Valve & Pressure Gauge	Continuous Monitoring - provides a secondary seal (rated for 6,000 PSI)	HA700481413	CS (cover), 316 SS (bleed val. & gauge)	10 lbs. (4.5 kg)
Heavy Duty Pressure Rated Cover, Bleed Valve, Pressure Gauge and 1/2" NPT Hole	Continuous Monitoring - provides a secondary seal (rated for 6,000 PSI)	HA700482413	CS (cover), 316 SS (bleed val. & gauge)	9 lbs. (4.1 kg)
Heavy Duty Pressure Rated Cover w/ Bleed Valve & 1/2" NPT Hole	Continuous Monitoring - provides a secondary seal (rated for 6,000 PSI)	HA700483413	CS (cover), 316 SS (bleed val.)	9 lbs. (4.1 kg)
Heavy Duty Pressure Rated Cover w/ Pressure Gauge & 1/2" NPT Hole	Continuous Monitoring - provides a secondary seal (rated for 6,000 PSI)	HA700484413	CS (cover), 316 SS (gauge)	9 lbs. (4.1 kg)

Cover Installation & Removal

All pressure retaining covers are supplied with an internal o-ring. Ensure that the o-ring is installed into the internal groove. Ensure the external threads on the access fitting body are clean and dry. Lubricate the threads with an appropriate grease, and thread the cover onto the fitting. Non-pressure retaining covers can be installed hand-tight. Pressure retaining covers should be tightened with a spanner wrench. To remove the cover, unscrew the cover from the fitting, using a spanner wrench to loosen the cover, if required. If pressure retaining covers are used, be sure all pressure is bled from the cover before removal. If it is not possible to bleed pressure, the cover should not be removed until the line is depressurized.